Geophysical Research Abstracts
Vol. 19, EGU2017-12488, 2017
EGU General Assembly 2017

Investigation of photon path length distributions in cloudy atmospheres using GOSAT satellite measurements

Beke Kremmling, Steffen Beirle, Marloes Penning de Vries, and Thomas Wagner
Max-Planck-Institut für Chemie, Mainz, Germany (beke.kremmling@mpic.de)

Photon path length distributions in the atmosphere are significantly affected by multiple scattering events by the presence of clouds. Our study investigates photon path length distributions for different cloud situations by combining high-resolution space-based measurements of the oxygen A-band with radiative transfer simulations. The measured spectra originate from the GOSAT TANSO-FTS instrument whose high spectral resolution allows to almost resolve individual absorption lines, which is a prerequisite to our study. The spectra are compared to radiance simulations from the Monte Carlo Model McArtim, which also provides detailed information on the simulated scattering events.

Apart from radiance spectra, the simulation output contains information on each simulated scattering event. This can be used to infer photon path length distributions. In addition, also the photon penetration depth and altitude-resolved photon path length distributions for individual altitude layers are derived.

To verify the retrieval method, the TANSO-FTS dataset has been screened for collocations with measurements from CALIOP (CALIPSO) and CPR (CloudSat). Well-characterized cloud scenes have been selected for further analysis. The spectral agreement is discussed and cloud characteristics, such as the cloud altitude, thickness and optical depth, are compared to the values measured by CALIOP and CPR.